Central Coast Marine Bird Health Study

This presentation covers an investigation on marine bird mortality factors leading to a systematic approach to marine bird health assessments in California. No birds were killed for this investigation. Birds used for this study were those that were found dead or died during attempted rehabilitation. Data from this study will aid in developing adaptive management priorities for seabirds; facilitating the use of seabirds as indicators of natural and human-related changes in the marine environment; monitoring trends in disease, survivorship, and population; and provide baseline health data.

Central Coast Marine Bird Health Study: Year 3

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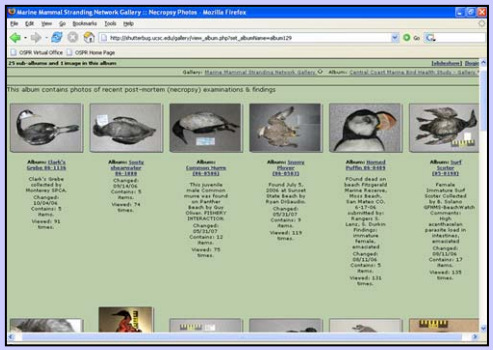
SSEP Symposium, 28 May 2008

Primary Goals

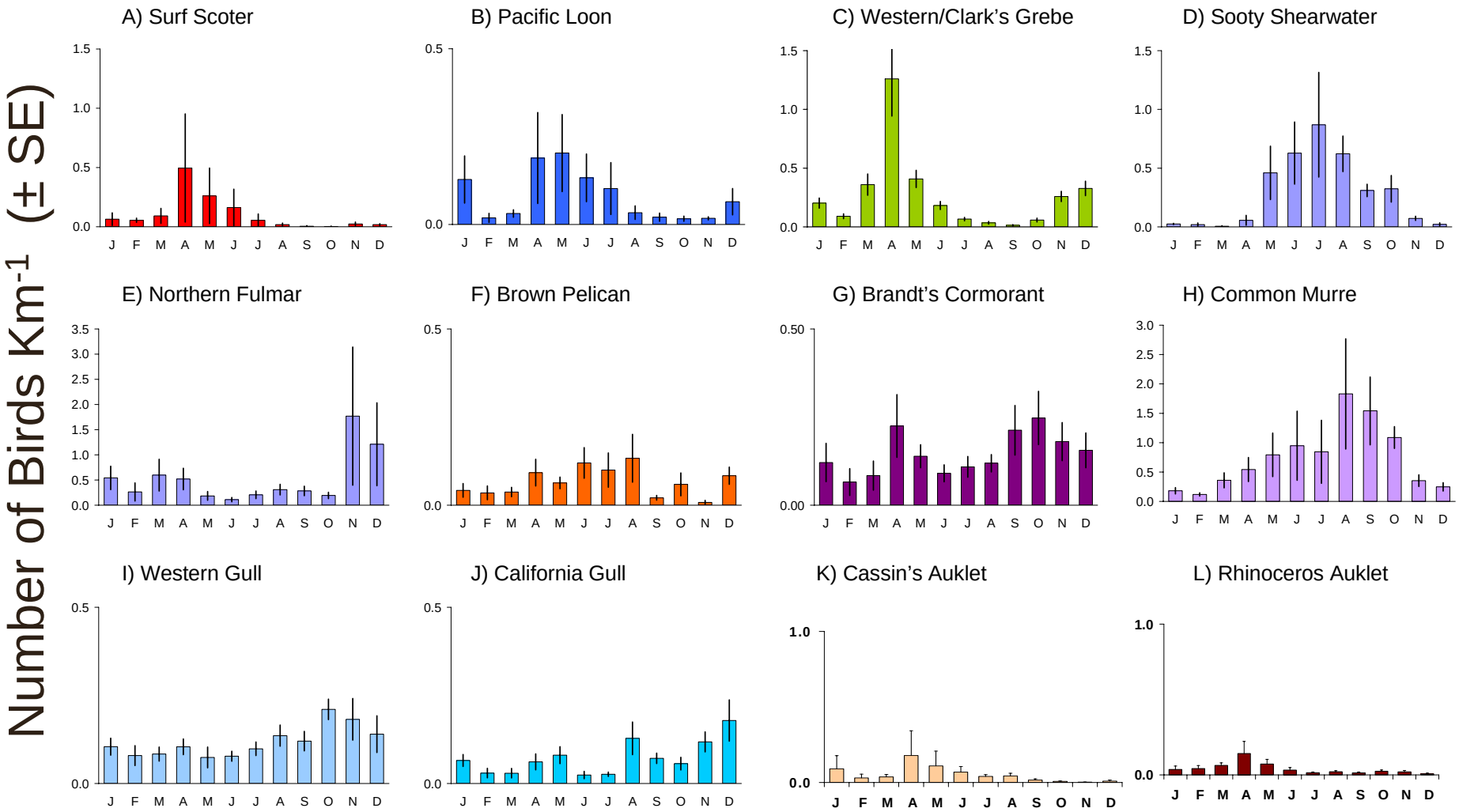
- To provide a regional center for understanding trends in mortality of marine birds
  - primarily species most often affected by oiling
- Integration of regional specialists to understand disease & other causes of mortality
  - wildlife & pathology experts (CDFG-OSPR, MWVCRC)
  - rehabilitation centers (IBRRC, SPCA, PWC, Peninsula Humane)
  - beach survey programs (BeachCOMBERS, BeachWATCH)
- Derive population-level understanding of marine birds affected by oil spills by examining, measuring and photographing post-litigation specimens

Methods



- Identify and quantify species-specific disease factors
  - Conduct necropsies of birds from rehabilitation centers and beach survey programs
  - Standard protocols
  - Submit samples to pathologist and other specialists
- Characterize “events” which are unusual in space or time

Seasonal deposition of ten most abundant seabirds, 1997–2007



BeachCOMBERS data

Clark's/ Western Grebe (*Aechmophorus* spp.)

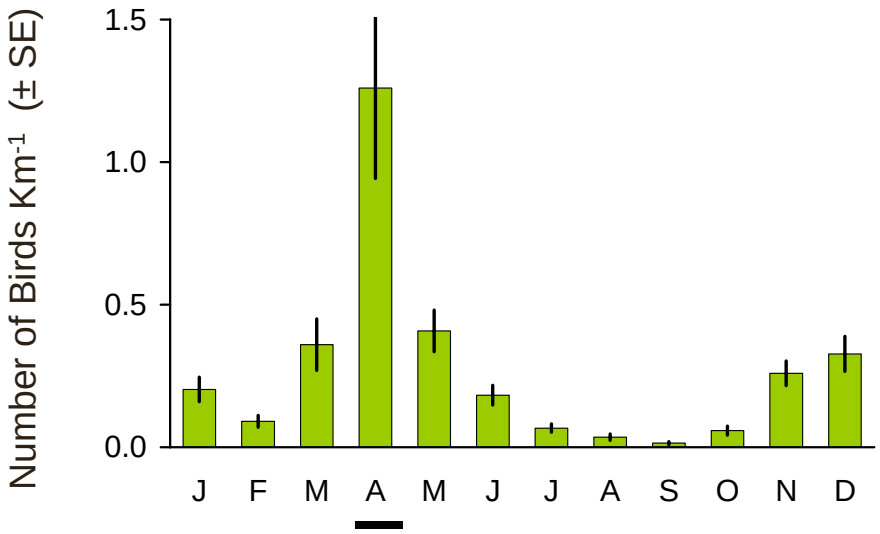
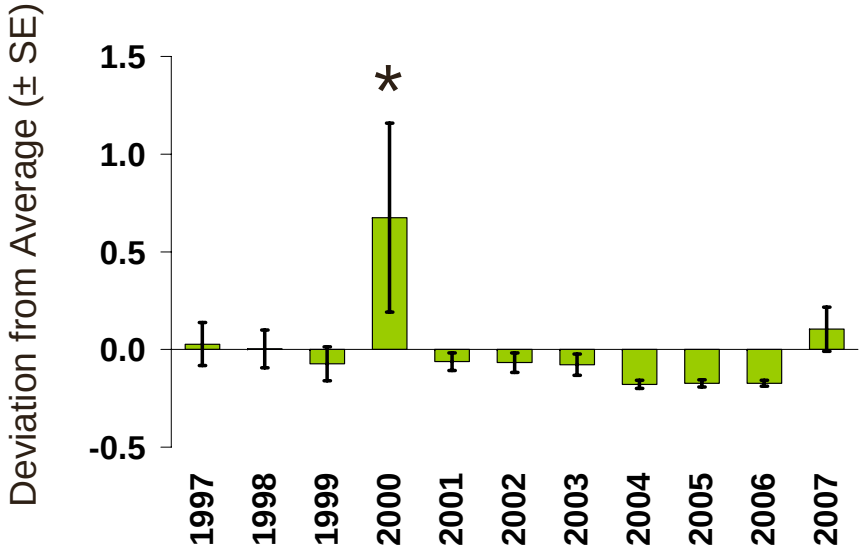
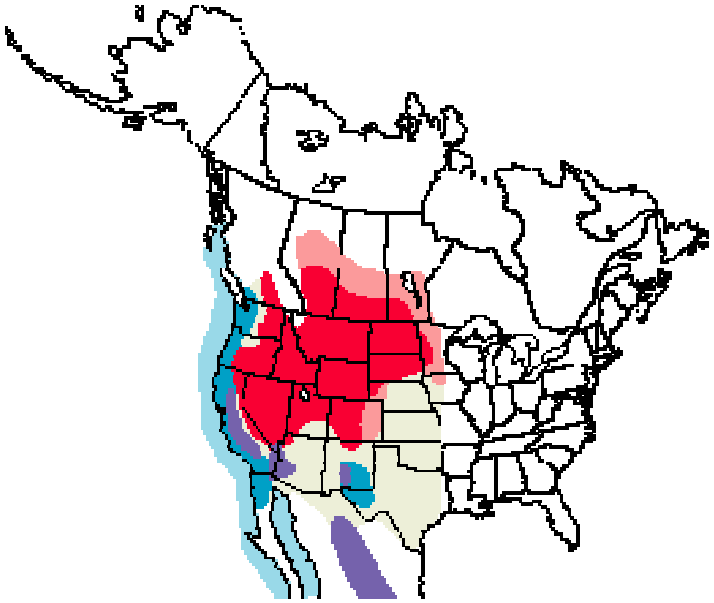


Photo: Laird Henkel

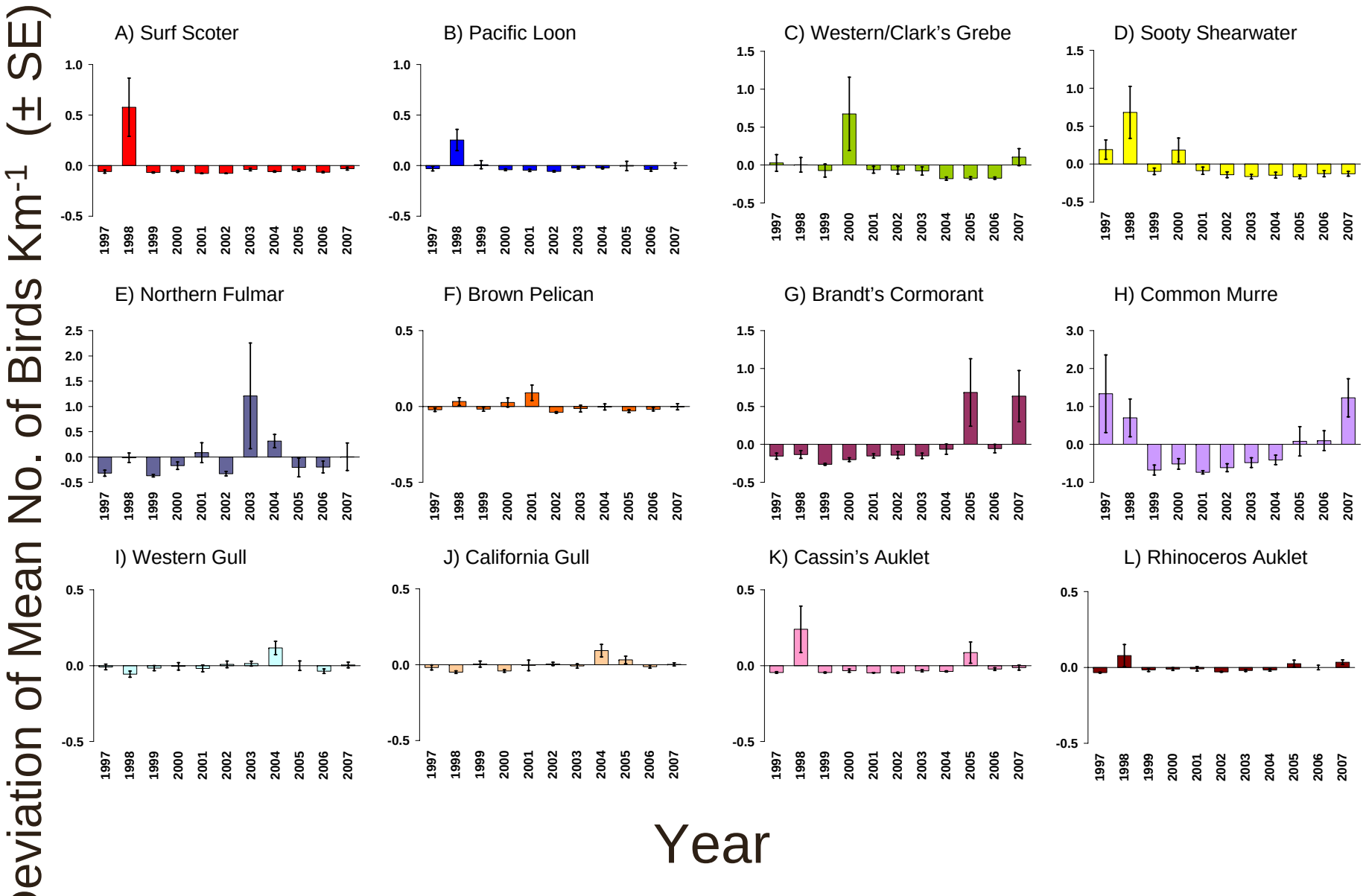




WEGR Range map (ODFG)

BeachCOMBERS data

Inter-annual deposition of ten most abundant seabirds, 1997–07



BeachCOMBERS data

Demographics: age and sex

- Age & maturity
  - Primary molt
  - Bursa of Fabricius
  - Gonad size
- Body condition
  - Body mass
  - Pectoral muscle mass
  - Liver mass
  - Subcutaneous fat layer

Life History of Common Murre

Non-breeding or winter

• **November to April**

Breeding at colony

• **May to July**

At sea chick-rearing by male parent

• **July to September**

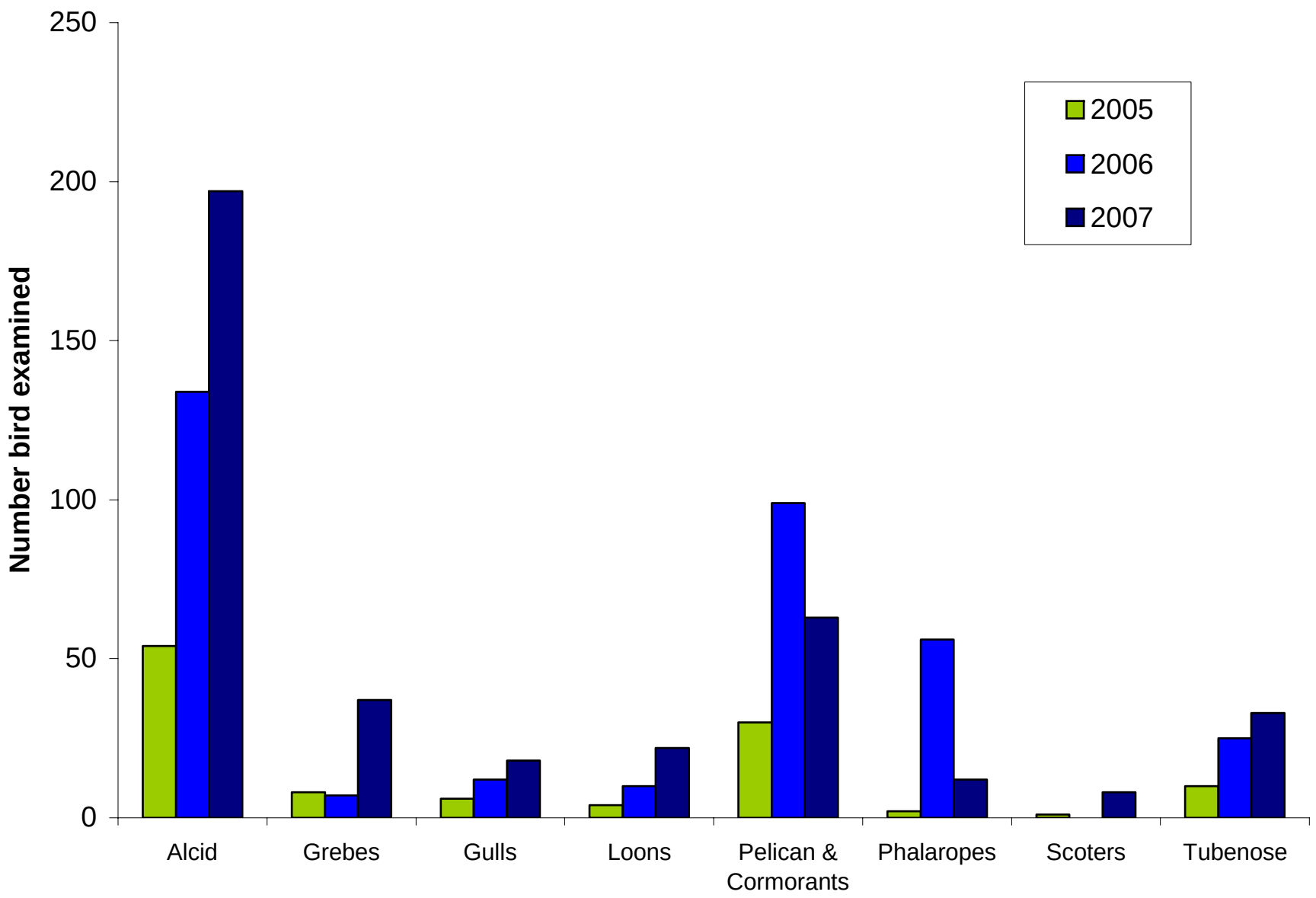
8 :1

Molting at sea

• **September to October**

Results

- Species-specific disease factors (n = cases)
  - 2005: n = 115
  - 2006: n = 343
  - 2007: n = 390
- Post-litigation samples
  - Kure (n = 602), Styvesant (169), San Mateo Mystery (339)
  - Santa Cruz “Mystery Spill” (276)
- Contributed samples to research projects:
  - M. Grigg for protozoal parasite study (1006)
  - Genetic stock analysis, USGS- Alaska (385)
  - Stable isotope analysis, UC Berkeley (139), UC Santa Cruz (60)
  - D. Humple, Sonoma State (~150) – grebe genetics


250
200
150
100
50
0
Number bird examined
2005
2006
2007
Alcid
Grebes
Gulls
Loons
Pelican & Cormorants
Phalaropes
Scoters
Tubenose

2007…

“outbreak of toxic algae is called the worst on record”
L. A. Times, May 9, 2007

“Struggling seabirds: Dead murres, auklets washing ashore with little in their stomachs”
SF Chronicle April 3, 2007

“Seabirds starving to death of county shores”
San Luis Obispo Tribune April 11, 2007

“Crisis off our coast: Deadly domoic acid killing record numbers of animals in Southern California”
IBRRC Press Release April 25, 2007

“Sick seabirds still inundating rescuers”
San Luis Obispo Tribune May 1, 2007

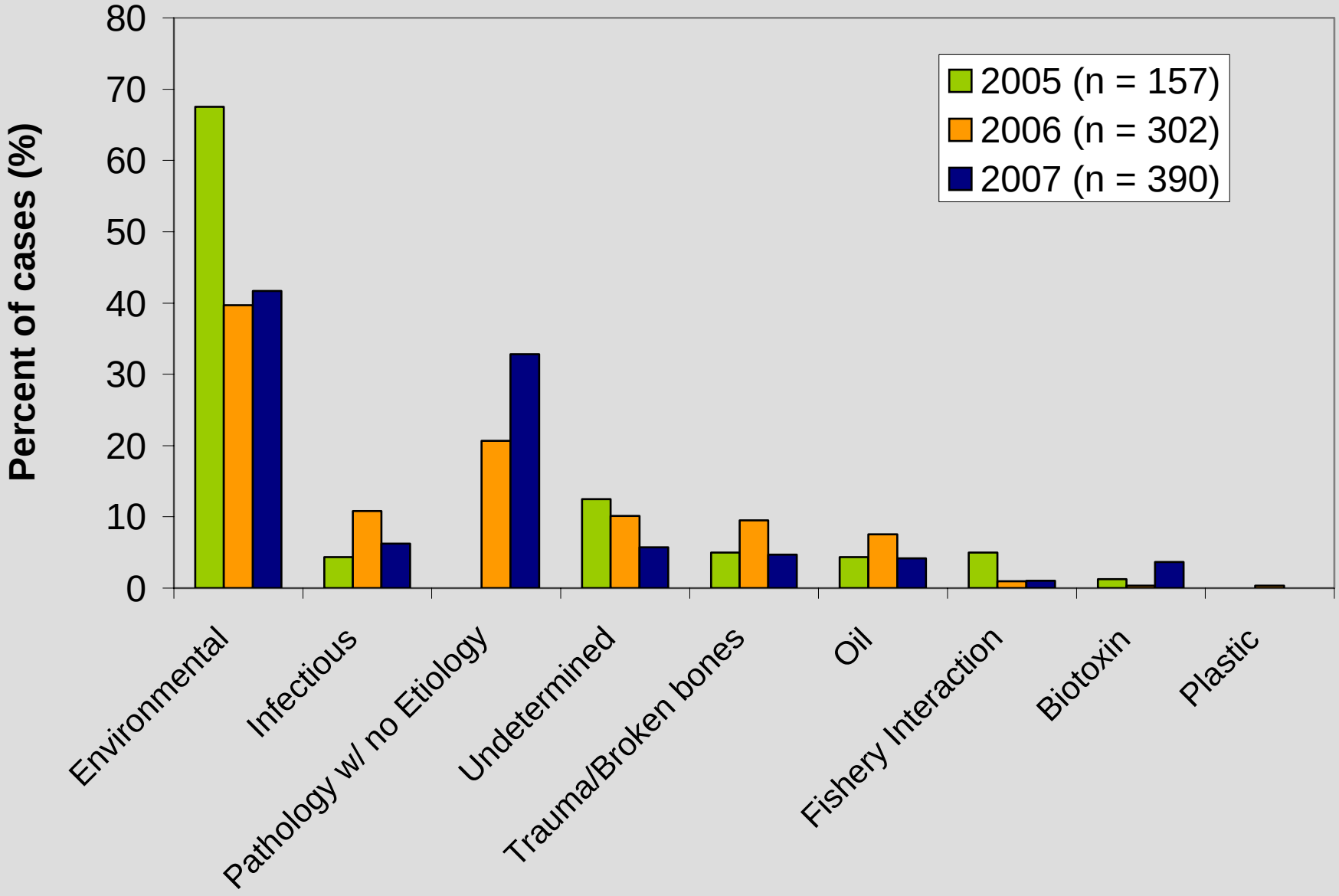
“Expect more dead birds and sea lions to wash ashore”
Santa Cruz Sentinel May 17, 2007

Necropsy findings

Mortality Factors

- Fishery interaction
  - Hook and line, net, other
- Trauma
  - Boat strike, blunt trauma, etc.
- Environmental
  - Starvation, Biotoxin (DA), species interactions
- Infectious
  - Fungal, bacterial, viral, parasitic
- Pathology with no Etiology
  - Lesions or other abnormalities on gross exam, pending pathological review or no diagnosis made
- Toxicosis
  - Oil
  - Chemical, metal poisoning (e.g. lead sinker)
- Undetermined
  - Too far decomposed to determine cause of death

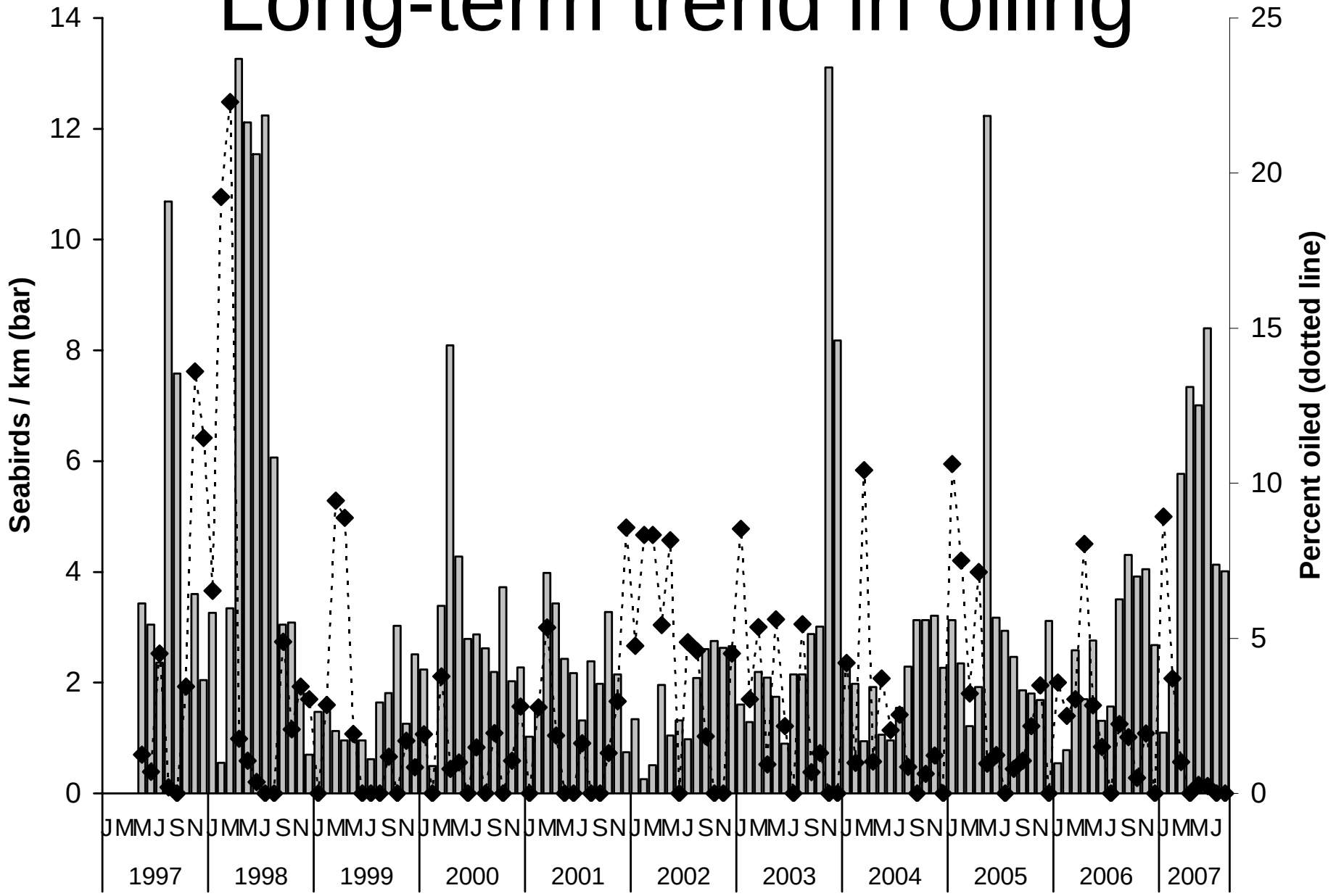
Probable cause of death



Oiled birds

Species	2005	2006	2007	Grand Total
Common Murre	3	14	4	21
Rhinoceros Auklet		4	4	8
Brown Pelican		2	2	4
Red Phalarope		3	1	4
Brandt's Cormorant	1		2	3
Western Gull		3		3
Ancient Murrelet	1	1	1	3
Northern Fulmar		1	1	2
Horned Puffin			2	2
Common Loon	1		1	2
Tufted Puffin		1	1	2
Western Grebe			1	1
Pacific Loon			1	1
Heermann's Gull		1		1
Grand Total	6	30	21	57

Long-term trend in oiling



Forked-tailed Storm-petrel 06-0365
Parasite-induced gastritis (inflammatory response to nematode)
Causing acute systemic bacterial infection

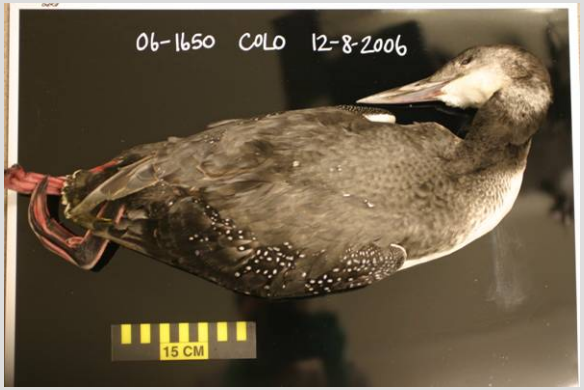
Pox virus

Northern Fulmar

Brown Pelican

Renal Coccidiosis
(kidney infection by a protozoal parasite)

Sooty Shearwater 06-1093



Common Loon 06-1650

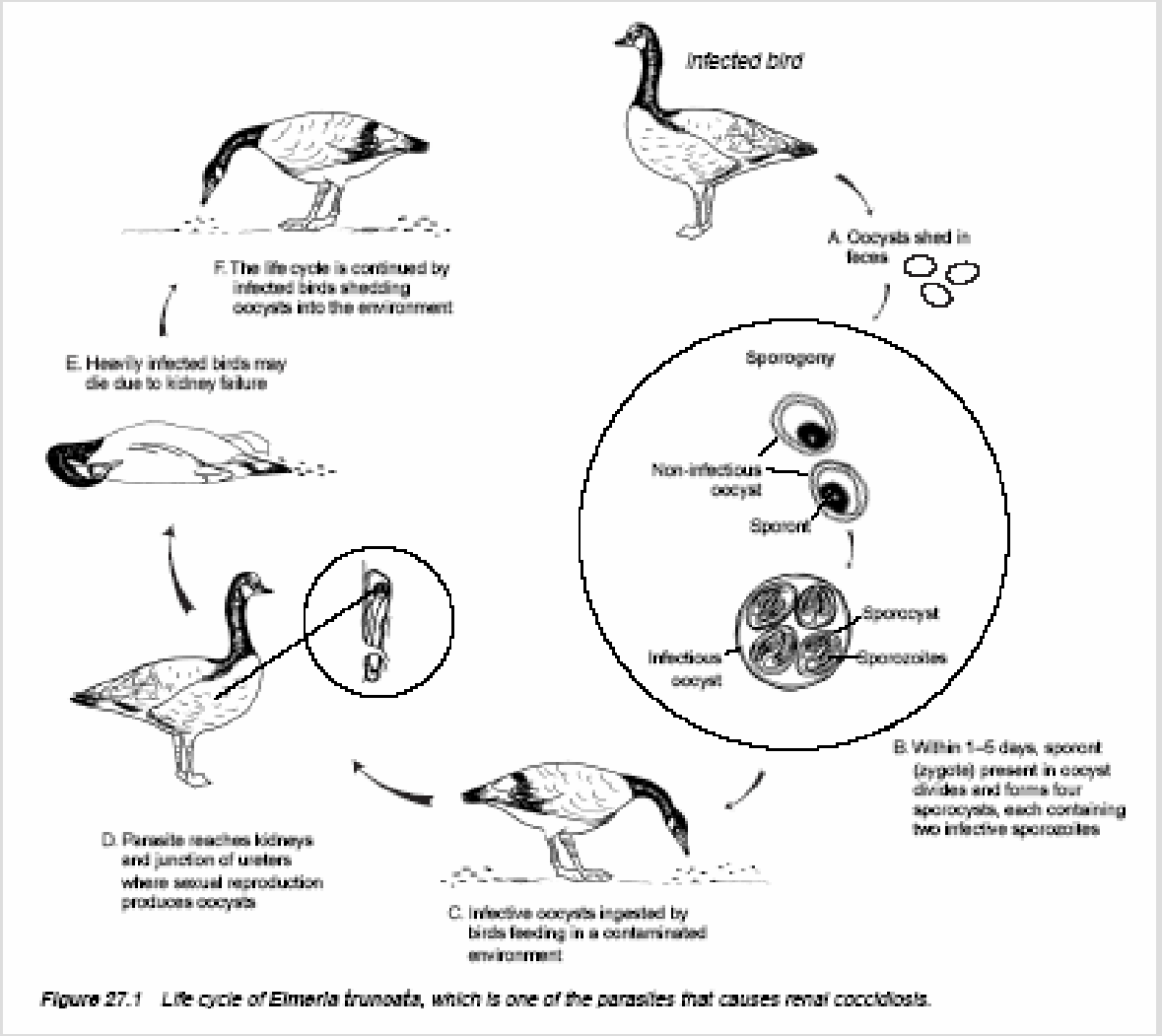
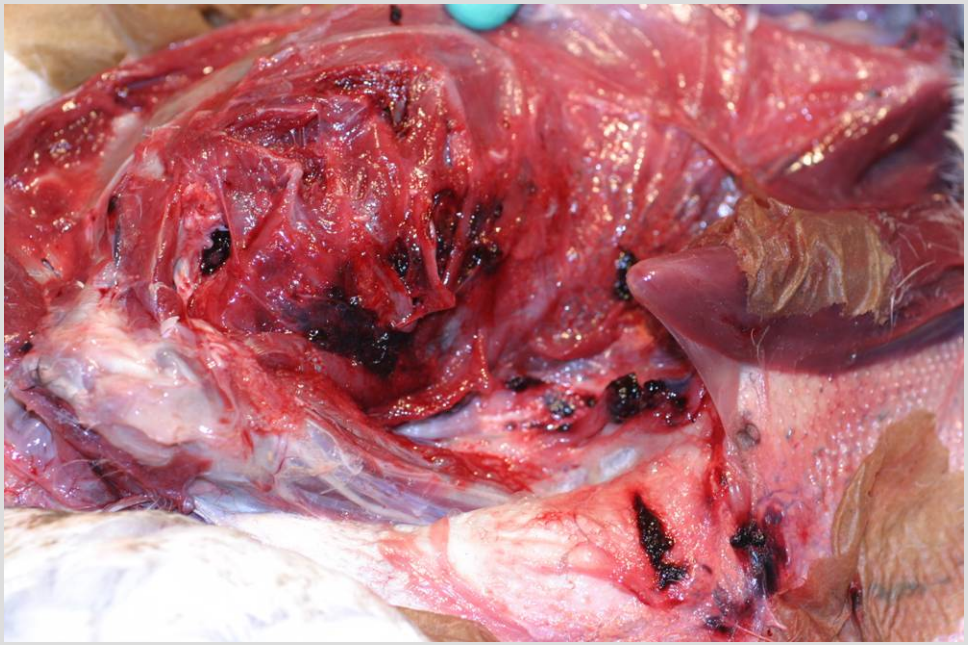


Figure 27.1 Life cycle of Eimeria truncata, which is one of the parasites that causes renal coccidiosis.



Trauma

- Common Loon
- Blood in trachea
- Lateral trauma
- Likely boat-strike

Common Murre 07-0479 AD F (100x)
Adenocarcinoma with proliferation of osteoids, ovary (tumor)
Unknown origin

Kure Spill

Humboldt Bay 1997

- Specimens collected November 7-22, 1997
  - Examined 602: Common Murres (249), Grebes (27), fulmars (104), other species (222)
- Murre demographics:
  - Adult/subadult (AHY/ASY) 63% (exp. 87%)
  - Juvenile/Immature (HY/SY) 37% (exp. 13%)**

- Sex Ratio M : F
  - COMU = 3.7 : 1 (175) ($p<0.001$)**
  - NOFU = 0.8 : 1 (47) ($p>0.05$, ns)
  - CWGR = 1.2 : 1 (26) ($p>0.05$, ns)

(**p=0.01, 1 df)

1999 M/V Stuyvesant Oil Spill

aka Humboldt Bay

- Specimens collected Sept 1999 (Post-breeding)
  - All species (n = 334, including 231 COMU and 24 MAMU)
- COMU Demographics:
  - Adult/subadult (AHY/ASY) 50% (exp. 87%)
  - Juvenile/Immature (HY/SY) 50% (exp. 13%)**
  - Undetermined 0%
- COMU Sex Ratio M : F
  - Adults = 15 : 1 (113) (p<0.001)**
  - Juvenile = 1.3 : 1 (113) (p=0.37, ns)
  - Unknown = (5)

(**p<0.001, 1 df)

San Mateo Mystery Spill

aka Luckenbach

- Specimens collected Dec 2001- Mar 2002
  - n = 169, all Common Murres (of 177 collected)
- Demographics:
  - Adult/subadult (AHY/ASY) 60% (exp. 87%)
  - Juvenile/Immature (HY/SY) 36% (exp. 13%)**
  - Undetermined 3%
- Sex Ratio M : F
  - Adults = 1.3 : 1 (98) (p>0.05, ns)
  - Juvenile = 1.0 : 1 (58) (p>0.05, ns)
  - Unknown = (16)

(**p=0.01, 1 df)

Seasonally changing age- and sex-specific movements:

- Kure ’97 (4:1, 63% adult) Nov
- San Mateo ’01-02 (1:1, 60% adult) Nov-Mar

- Pr Tarball ’97-98 (1.6:1*, 85% adult) Nov-Mar

Adult male dispersal & juveniles inshore

Non-breeding or winter

November to April

Breeding at colony

May to July

Life History of Common Murre

Molting at sea

• **September to October**

At sea chick-rearing by male parent

July to September

- MB Gill-net ‘99-00 (8:1, 50% adult) Aug
- Styuvesant 99 (15:1, 50% adult) Sept

- Post-breeding segregation of adults
  - Males & chicks move into coastal areas
  - Females disperse offshore
- Winter - adult males disperse and juveniles remain inshore
  - Females remain dispersed?

Female dispersal?

Conclusions

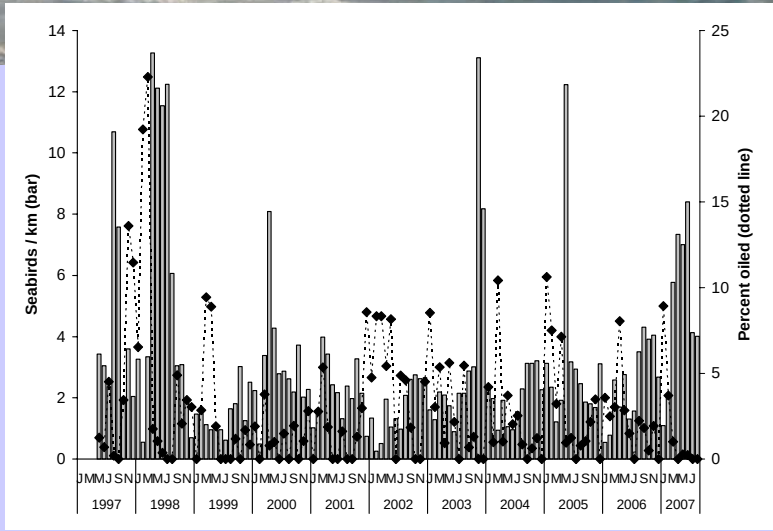
- During 2005-2007, we measured increased rates of mortality
  - Improved documentation of die-offs of various species (i.e. phalaropes, pelicans, murres, etc.)
  - Increased ability to determine cause of death (e.g. diseases)
  - Beginning to track trends in mortality factors
- Demographics of each mortality event are different
  - Dependent on time of year (post-breeding, winter)
  - This will influence vulnerability of population to oil spills – both catastrophic and chronic

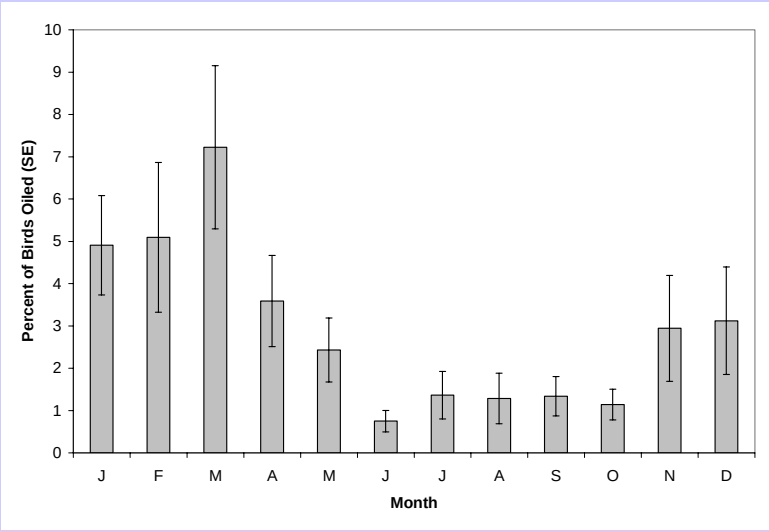
We need greater understanding of the population-level impacts…

Future Work

Quantify chronic oiling:

- Examining sources of individual oiled birds
- Using data from OSPR-Petroleum Chemistry Lab
- Examine post-litigation specimens





Acknowledgments

- Josh Adams, USGS – WERC, MLML
- Rehabilitation centers: Monterey SPCA – Sue Campbell, Peninsula Humane, NAR Santa Cruz
- IBRRC – Michelle Bellizi, Marc Russell, Susan Kavaggia & Jay Holcomb
- Beach survey programs: Beach Combers, Beach Watch – Jan Roletto & Shannon Lyday
- Volunteers: Sandrine, Kim, Erin Feinblatt, Kristine, Lon Otterby, Carolyn Skinder
- MLML students: Cori Gibble, Melinda Nakagawa, Brian Hoover, Joelle Sweeney, Lisa Wertz
- Melissa Miller, Amy Wells, DVM, Francesca Batac, Eva Berberich, Erin Dodd, Adam Schneider, Sharon Toy-Chouka, Tamara Mills

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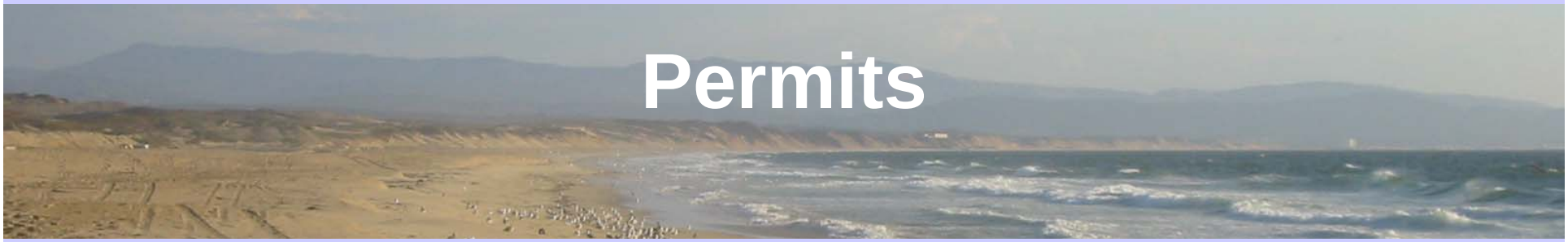
- Beach COMBERS is supported in part from a research grant from the Science Integrated Monitoring Network (SIMoN) through Monterey Bay National Marine Sanctuary.
- Logistical and administrative support by Moss Landing Marine Laboratories – California State Universities



Permits

The animal handling and sampling techniques used were approved under a research permit by California Department of Fish and Game (Scientific Collecting permit #SC-005439; exp. 19 July 2007) and approved by the San Jose State University Institutional Animal Care and Use Committee (IACUC # 874; exp. 30 June 2008).

Table 4.c.2 Summary of other mortality events recorded by BeachCOMBERS, 1997-2007 quantified based on criteria i

Year	Name	Species-affects detected	Start	Dur**	Number of species	Number of T&E species
2005	Mystery Spill	Common Murre	Jan	10	17	1
		Rhinoceros Auklet	Jan	10		
		Northern Fulmar	Jan	1		
		Brandt's Cormorant	Jan	5		
		Cassin's Auklet	Jan	1		
		Sooty Shearwater	Aug	2		
		Short-tailed Shearwater	Jan	1		
2005	Cement Ship/ Seacliff Oil	Brandt's Cormorant	Jun	6	3	1
2006	Brown Pelican event	Brown Pelican	Apr	1	1	1
2006	Red Phalaropes	Red Phalarope	Nov	3	1	0
2007	Fulmar Die-off	Northern Fulmar	Nov	1	1	0
2007	Cosco Busan oil spill	Clark's Grebe	Nov	1	1	0
2007	"Puffin invasion"	Horned Puffin	Mar	4	2	1
		Tufted Puffin	Jun	1		0

Signal: HAB = Harmful algal bloom, OIL= Petroleum plumage fouling resulting in death, YOY-young of the year mortality, ENV

* Likely deposition was affected by increased collection effort during spill response, so there was no significant anomally dete
**Duration in months inclusive months of anomalous even if 3 of 5 exceed TL.
***Data from H. Nevins unpublished, post-litigation examination of carcasses (n = 164).
****Includes one oiled individual for each of the following species (see AOU species list): ANMU, BRPE, BVSH, COLO, CORM
Reference includes a significant resulting report, publication, article, poster, or presetation (see Appendix D: List of products f